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**Name of Organization:** USGS - Great Lakes Science Center

**Type of Organization:** Federally-funded R & D Center

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**Project Title:** Round gobies in Lake Huron: Effects on the offshore food web

**Project Category:** Exotic Species

**Rank by Organization (if applicable):** 0

**Total Funding Requested (\$):** 81,774 **Project Duration:** 2 Years

**Abstract:**

It is well known that the exotic goby has invaded the nearshore waters of the Great Lakes, but this is the first investigation of the impact of the round goby on the offshore food web in the Great Lakes. The round goby has been found to have a capability of migrating to the profundal zone of southern Lake Huron at depth over 70 m. This exotic fish may have potential negative effect on the offshore food web, especially when it overwinters there. While gobies will be collected from Lake Huron in mid-autumn and mid-spring, the stable carbon and nitrogen isotope method will be used to determine winter diet of gobies. The results will be important because we hypothesize that the diet of lake trout and burbot will be changed as the populations of native amphipods and sculpins in the offshore waters are decreasing due to round goby predation and competition. These changes in the offshore food web likely will affect contaminant concentrations and pathways in Lake Huron and the deepwaters of the other Great Lakes as well.

**Geographic Areas Affected by the Project****States:**

<input type="checkbox"/> Illinois	<input type="checkbox"/> New York
<input type="checkbox"/> Indiana	<input type="checkbox"/> Pennsylvania
<input checked="" type="checkbox"/> Michigan	<input type="checkbox"/> Wisconsin
<input type="checkbox"/> Minnesota	<input type="checkbox"/> Ohio

**Lakes:**

<input type="checkbox"/> Superior	<input type="checkbox"/> Erie
<input checked="" type="checkbox"/> Huron	<input type="checkbox"/> Ontario
<input type="checkbox"/> Michigan	<input type="checkbox"/> All Lakes

**Geographic Initiatives:**

<input type="checkbox"/> Greater Chicago	<input type="checkbox"/> NE Ohio	<input type="checkbox"/> NW Indiana	<input type="checkbox"/> SE Michigan	<input type="checkbox"/> Lake St. Clair
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**Primary Affected Area of Concern:** St. Clair River, MI**Other Affected Areas of Concern:** Saginaw Bay***For Habitat Projects Only:*****Primary Affected Biodiversity Investment Area:****Other Affected Biodiversity Investment Areas:****Problem Statement:**

An exotic fish, the round goby (*Neogobius melanostomus*) from the Caspian and Black Seas, was first discovered in the St. Clair River in 1990 and has expanded its range rapidly throughout the Great Lakes. Potential impacts of round gobies on the Great Lakes fauna are 1) competition for habitats and diet overlaps with native benthic forage fishes, 2) predation on small fish juveniles and eggs and 3) changes in contaminant concentrations and pathways through changes in the food web. Populations of mottled sculpins in the St. Clair (MI) and Calumet (IN) Rivers were decimated after gobies successfully invaded their spawning habitats and spawned there. The round goby is tolerant of extremely diverse environmental conditions. While conducting the annual fall forage fish survey in 1999, biologists of the USGS-Great Lakes Science Center reported a large increase in round goby populations in Michigan waters of Lake Huron and expansion of range to 35 km offshore from Michigan at depths over 70 m. The purpose of this project is to determine diet, diet overlap, population dynamics, and impacts of round goby on benthic fauna in offshore waters of Lake Huron.

**Proposed Work Outcome:**

The first report of round goby in offshore waters of the Great Lakes (depth > 40 m) caused a concern among fishery biologists that gobies may negatively impact populations of native sculpins. Sculpins are seasonally important in diets of lake trout and burbot in the Great Lakes. Round gobies typically migrate to deeper waters for overwintering. These gobies have some advantages over native sculpins; 1) aggressive behavior, 2) ability to detect movement of prey at long distance in dark, 3) large size (total length up to 25 cm as compared to 16 cm for deepwater sculpin), and 4) possession of large oral teeth to effectively prey on fishes.

Winter food habits of round gobies are little studied. In winter, the gobies consumed both small fishes and bivalves in Azov Sea, Ukraine and Russia. Ice coverage and rough weather discourage collection of round gobies from the Great Lakes for study of winter diets. The stable carbon and nitrogen isotope method may be the only technique to determine winter diet of gobies because it can provide information on long-term diets (up to three months) of fishes and differentiate feeding types, e.g. planktivore and piscivore. Changes in carbon and nitrogen isotope levels of fish muscle tissues from fall to spring would determine a shift in goby diet in winter. This technique requires collections of fishes, benthic crustaceans, mollusks, and sediments from Lake Huron in fall and spring. Samples will be collected aboard the GLSC's R/V Grayling, processed at the GLSC and shipped to a private laboratory for stable isotopic analysis.

The USGS-Great Lakes Science Center has conducted annual surveys of forage fishes in the U.S. waters of Lake Huron since 1973. Round gobies and benthic native forage fishes will be sampled annually to assess population dynamics in offshore waters and potential impacts of gobies on the fish community. Macroinvertebrates will be collected because populations of deepwater amphipod (*Diporeia hoyi*), the important food of sculpins, have decreased presumably due to

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increasing abundance of dreissenids and decreasing nutrient loading. Diets of gobies and benthic native fishes will be studied, and prey found in stomachs of both fishes will be analyzed to determine diet overlaps in these fishes.

**Project Milestones:****Dates:**

Project Start

06/2000

Fall Cruise

10/2000

Ship samples for isotope analysis

12/2000

Spring Cruise

04/2001

Ship samples for isotopes analysis

06/2001

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Project End

09/2001

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Project Addresses Environmental Justice

**If So, Description of How:**

none



Project Addresses Education/Outreach

**If So, Description of How:**

Evaluations of the results will be provided to managers of federal agencies (USEPA, USGS, USFWS, NOAA), the Great Lakes Fishery Commission, state agencies, and universities and presented at scientific conferences and lake committee meetings.

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**Project Budget:**

	<b>Federal Share Requested (\$)</b>	<b>Applicant's Share (\$)</b>
<b>Personnel:</b>	0	52,000
<b>Fringe:</b>	0	14,560
<b>Travel:</b>	0	1,000
<b>Equipment:</b>	0	1,000
<b>Supplies:</b>	2,500	1,000
<b>Contracts:</b>	44,400	0
<b>Construction:</b>	0	0
<b>Other:</b>	18,000	6,000
<b>Total Direct Costs:</b>	64,900	75,560
<b>Indirect Costs:</b>	16,874	0
<b>Total:</b>	81,774	75,560
<b>Projected Income:</b>	0	0

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**Funding by Other Organizations (Names, Amounts, Description of Commitments):**

Salary and fringe of principal investigator are provided by USGS.

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**Description of Collaboration/Community Based Support:**

Our partners may include A. Hintz of the USFWS in Alpena, MI and L. C. Mohr of the OMNR in Owen Sound, Ontario.